

Remarks

Support for the above-requested amendments to claim 1 is found at least on page 8, lines 24-28 and Figure 1. Support for the amendments to claim 22 is found at least on page 5, lines 19-23. Claims 10, 11, and 31-33 have been canceled without prejudice. Claims 12-21 were canceled without prejudice in a previous Amendment. Support for new claim 34 is found at least on page 5, lines 23-29. Support for new claim 35 is found at least on page 2, lines 1-5; page 3, lines 33-37; and the Examples. New claim 36 is supported at least by page 4, lines 5-22; page 11, lines 5-10; and claim 1 as originally presented. Support for new claim 37 is found at least on page 11, lines 31-34 and claim 11 as originally presented. New claim 38 is supported at least by page 5, lines 23-29. No question of new matter arises and entry of the above-requested amendments and new claims is respectfully requested.

Claims 1-9, 22-30, and 34-38 are before the Examiner for consideration.

Formal Matter

As shown above, Applicants have added new claims 34-38 by amendment (*i.e.*, five claims). Because the total number of claims Applicants are submitting for examination (*i.e.*, twenty-three claims) is not greater than the total number of claims previously paid for (*i.e.*, twenty-three claims), Applicants respectfully submit that no additional filing fees are required for newly added claims 34-38.

In addition, Applicants respectfully submit that there are no fees required for new independent claim 36 because the total number of independent claims present in the application (*i.e.*, three independent claims) does not exceed the total number of independent claims permitted without incurring additional fees (*i.e.*, three independent claims). Furthermore, because support for newly added claims 34-38 is found throughout the specification, as identified in the opening paragraph of the Remarks, Applicants respectfully submit that these newly added claims do not contain any new matter.

Election/Restriction

The Examiner has asserted that newly added claims 31-33 are directed to an invention that is independent or distinct from the invention originally claimed. The Examiner states that because Applicants have received an action on the merits for the originally presented invention, that invention has been constructively elected. Accordingly, claims 31-33 have been withdrawn from consideration as being directed to a non-elected invention.

In this regard, Applicants have canceled claims 31-33 without prejudice for pursuit in a divisional application.

Rejection under 35 U.S.C. §112, second paragraph

Claims 1 and 22 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite. In particular, the Examiner asserts that although claims 1 and 22 recite an “organic material capable of forming a matrix”, the remainder of the claim does not cite a matrix formed from such material. Accordingly, it is unclear to the Examiner if the organic material merely needs to be capable of forming a matrix or if it actually does form a matrix. Additionally, the Examiner asserts that the presence of “a matrix” in the composite while the yarns are converted into a matrix is confusing. In addition, it is unclear to the Examiner if the organic material recited within claim 1 and claim 22 are the same or different. Further, the Examiner asserts that the term “high” recited in claim 22 is not defined or ascertainable by one of skill in the art.

In response to this rejection, claims 1 and 22 have been amended to remove the phrase “organic material capable of forming a matrix”. In addition, Applicants have removed the word “high” from claim 22. Applicants submit that as amended, claims 1 and 22 are sufficiently definite and respectfully request reconsideration and withdrawal of this rejection.

Rejection Under 35 U.S.C. §103(a)

Claims 1-11 and 22-30 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,496,415 to Sprengling (“Sprengling”) in view of EP 410678 to Jeffs, *et al.* (“Jeffs”). The Examiner asserts that Sprengling teaches a method of forming “composite” sheets that include (1) providing a continuous sheet, (2) depositing it onto a moving belt, (3) applying an organic dry resin powder, and (4) applying heat and pressure to cause the resin to flow into the fibrous materials to wet and adhere the fibers. The Examiner admits that Sprengling fails to teach that the deposited continuous fiber substrate contains at least one organic and one reinforcing material.

In this regard, Jeffs is cited for assertedly teaching a process for forming a fiber reinforced plastic composite sheet where the permeable sheet is coated with a surface layer of particulates and then treated to form a layer with an improved surface finish. It is asserted that the surface finish prevents strike-through of the reinforcing fibers at the surface. The Examiner also asserts that the particulates include one or more of a thermoplastic or

thermoset resin. In addition, it is asserted that Jeffs teaches that the fiber-bearing layer may be formed of a mixture of continuous or chopped fibers admixed with resin binders or thermoplastic binder filaments. The Examiner concludes that it would have been obvious to one of skill in the art to modify the method of Sprengling to incorporate at least one organic and reinforcing material as disclosed by Jeffs because of the predictability of the outcome of combining known steps and elements to produce a desired end product.

Applicants' Response

In response to this rejection, Applicants respectfully direct the Examiner's attention to independent claims 1 and 22 and submit that claims 1 and 22 define a process for manufacturing composite sheets (claim 1) and a process for manufacturing composite sheets at least partly formed of intermingled yarns (claim 22) that are neither taught nor suggested by Sprengling and Jeffs. In addition, Applicants submit that Sprengling and Jeffs fail to teach the combination of features recited in claims 1 and 22.

Turning first to claim 1, Applicants respectfully submit that neither Sprengling nor Jeffs teaches or suggests a process for manufacturing composite sheets that includes the steps of (1) heating the web coated with the powder to a temperature sufficient to both melt the powder into a smooth surface layer and melt the organic material to form a matrix within which the reinforcing material is embedded and (2) compressing and cooling the web to form a composite strip formed of the matrix embedded with the reinforcing material and the smooth surface layer on an external surface thereof. Sprengling clearly teaches a method for forming a multi-layered laminate lay-up. (*See, e.g.*, column 2, lines 12-25 and the Abstract). In Sprengling, a porous sheet of fibrous materials is fed from a reel onto a conveyor. (*See, e.g.*, column 3, lines 34-41). A thermosettable dry resin powder is applied directly to the sheet. (*See, e.g.*, column 3, lines 46-48). A second sheet of fibrous material is then applied over the resin powder such that the resin is sandwiched between the fibrous sheets. (*See, e.g.*, column 3, lines 49-52 and the Figure). A flexible, B-staged thermoset resin-impregnated decorative print or overlay paper sheet may be fed from a separate reel to provide a top layer for the laminate. (*See, e.g.*, column 4, lines 37-40). Optional, additional layers may be provided for decoration. (*See, e.g.*, column 4, lines 48-51). When heated, the powder resin melts and flows to bond the fibrous sheets together and form the laminate structure. (*See, e.g.*, column 5, lines 18-27). Thus, the powder resin of Sprengling serves to bond the laminate together.

In contrast, the process of the invention forms a composite strip that is formed of a matrix of a thermosetting or thermoplastic material embedded with a reinforcing material and an outer layer formed of the melted powdered organic material. This strip can be cut in the form of sheets or wound onto a support. The powdered organic material is utilized to provide a smooth, outer coating that renders the reinforcing fibers invisible. (*See, e.g.*, page 7, lines 34-39 of the instant application). Sprengling simply does not teach or suggest a composite strip formed of a matrix embedded with a reinforcing material and a smooth surface layer positioned on an external surface thereof as required by claim 1. Sprengling clearly and specifically teaches the formation of a laminate structure with a powdered resin sandwiched between at least two fibrous structures. The laminate of Sprengling and the inventive composite strip are very different structures, and Sprengling does not teach or suggest a process for forming a composite strip or the composite strip itself.

In the outstanding Office Action, the Examiner asserts that Jeffs teaches the use of thermoplastic and reinforcing materials in the fiber structure and that it would have been obvious to use such a fiber structure in Sprengling. (*See, e.g.*, page 5, lines 2-5 and page 6, lines 3-6 of the Office Action dated July 2, 2009). Applicants respectfully disagree. Sprengling specifically teaches the formation of a laminate of two webs of fibers and a center resin layer that melts to hold the fiber webs together. Applicants submit that one of skill in the art reading Sprengling would have no motivation to use a fiber web that includes a thermoplastic or thermosetting component. As one of skill in the art would appreciate, laminate structures unite two layers together as one unitary structure. In the case of Sprengling, the fibrous layers are united by the melting and distribution of the central layer of powdered resin. It is respectfully submitted that one of skill in the art would have no reason or desire to look elsewhere, such as to Jeffs, for an alternate means to hold the fiber layers together, but if they did, it is respectfully submitted that it would be for an alternate bonding material for the central layer of the laminate structure, not for an alternate fibrous web.

Assuming, *arguendo*, that a fibrous web of thermoplastic and reinforcing fibers were used as the fibrous sheets of Sprengling, it is respectfully submitted that the combination would not result in the claimed invention. As discussed above, Sprengling teaches a laminate structure. Substituting a fibrous web of thermoplastic and reinforcing fibers for the fibrous sheet of Sprengling would still result in a laminate structure, albeit a different laminate than that originally conceived of by Sprengling. For example, using the process of Sprengling, the powdered resin would be positioned between the fibrous/thermoplastic sheets and heated to

form a laminate. By definition, a laminate has two (or more) layers. In contrast, the claimed invention has only one web and forms a composite strip. A laminate and a composite are simply not the same structure.

Additionally, the Examiner asserts that the references teach coating surfaces to form a smooth surface or “topcoat”. (See, e.g., page 6, lines 13-14 of the Office Action dated July 2, 2009). Assuming that such a teaching exists, such a topcoat would only serve to add a surface layer to the laminate structure, and the end result would still not be the claimed method forming the claimed composite.

In addition, Applicants respectfully submit that there is no motivation for one of skill in the art to arrive at the strengthening material of claim 1 based on the teachings of Sprengling and Jeffs. In order to establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings, and the prior art reference (or references when combined) must teach or suggest all the claim limitations. (See, e.g., *Manual of Patent Examining Procedure*, Patent Publishing, LLC, Eighth Ed., Rev. 7, August 2008, §2143 citing *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398, 82 USPQ2d 1385 (2007)).

It is respectfully submitted that one of ordinary skill in the art would have no motivation to arrive at a process for manufacturing composite sheets that includes (1) continuously depositing a web of continuous yarns on a moving substrate, where the web comprises at least one organic material and at least one reinforcing material, (2) depositing a powder of an organic material on at least one surface of the web, (3) heating the web coated with the powder to a temperature sufficient to melt the powder into a smooth surface layer and melt the organic material to form a matrix within which the reinforcing material is embedded, (4) compressing and cooling the web to form a composite strip formed of the matrix embedded with the reinforcing material and the smooth surface layer on an external surface thereof, and (5) cutting the strip in the form of sheets or winding the strip on a rotating support based on the teachings of Sprengling and Jeffs at least because Sprengling specifically teaches the formation of a laminate structure formed from two fibrous sheets and a powder resin core. It is respectfully submitted that the combination of the teachings of Sprengling and Jeffs still results in a laminate structure. In contrast, in the claimed process, the powder coated web is heated to form a composite strip formed of a matrix embedded with the reinforcing material and an external, smooth surface

layer. Without some teaching or suggestion, there can be no motivation, and without motivation, there can be no *prima facie* case of obviousness.

Turning to claim 22, Applicants submit that Sprengling and Jeffs do not teach or suggest a process that includes the step of continuously depositing a web of yarns, in the form of a mat of continuous yarns, where the web is formed at least partly from intermingled yarns consisting of filaments of a thermoplastic organic material and glass filaments intimately mixed. Sprengling, as discussed above, teaches fibrous webs but is silent regarding a fibrous structure of mixed thermoplastic and organic materials. Jeffs is also silent regarding a fibrous structure of mixed thermoplastic and organic materials. However, the Examiner points to U.S. Patent No. 3,323,383 to Roscher, *et al.* (“Roscher”) cited within Jeffs for assertedly teaching that the fiber bearing layer may be formed of a mixture of fibers admixed with resin binders or binder filaments. (*See, e.g.*, page 5, lines 2-8 of the Office Action dated July 2, 2009).

It is respectfully submitted that Roscher teaches preformed mats composed of natural and/or synthetic fibers intermeshed with synthetic resin filaments. (*See, e.g.*, column 1, lines 40-43 Roscher). Additionally, Roscher teaches a process that forms thermoplastic binder filaments that are readily chopped or severed and immediately thereafter “simultaneously and in one step severing and uniformly distributing both the binder filaments and the glass fibers to form an intermeshed mat”. (*See, e.g.*, column 1, line 63 to column 2, line 1 of Roscher). Applicants submit that such a mat of intermeshed chopped fibers is very different from a web that includes yarns of intermingled fibers. There is simply no teaching or suggestion in Roscher (and Jeffs) of intermingled yarns consisting of filaments of a thermoplastic organic material and glass filaments intimately mixed as is required by claim 22. Indeed, Roscher (and Jeffs) are silent with regard to yarns of mixed fibers. As mentioned previously, Sprengling is silent with respect to any teaching or suggestion of intermingled yarns. Accordingly, it is respectfully submitted that the combination of the teachings of Sprengling and Jeffs (and Roscher) would not result in the process of claim 22. Thus, Applicants respectfully submit that claim 22 is non-obvious and patentable.

In addition, it is respectfully submitted that there is no motivation for one of skill in the art to arrive at the strengthening material of claim 22 based on the teachings of Sprengling and Jeffs.¹ Applicants respectfully submit that one of ordinary skill in the art would have no

¹ In order to establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify

motivation to arrive at a process for manufacturing composite sheets that includes (1) continuously depositing a web of yarns, in the form of a mat of continuous yarns, where the web is formed at least partly from intermingled yarns consisting of filaments of a thermoplastic organic material and glass filaments intimately mixed, (2) depositing on at least one side of the web a powder of an organic material having a film-forming capability in an amount sufficient to form a smooth surface under the action of heat, (3) heating the web coated with the powder to a temperature high enough to convert the web of yarns into a matrix within which the glass filaments are embedded and to melt the powder into a topcoat having a smooth surface, and (4) compressing and cooling the web to form a composite strip based on the teachings of Sprengling and Jeffs because Sprengling and Jeffs (and Roscher) are silent with respect to any teaching or suggestion of intermingled yarns that are formed of filaments of a thermoplastic organic material and glass filaments intimately mixed. Without some teaching or suggestion, there can be no motivation, and without motivation, there can be no *prima facie* case of obviousness.

Also, as discussed above, Sprengling and Jeffs (and Roscher) do not teach or suggest intermingled yarns that are formed of filaments of a thermoplastic organic material and glass filaments intimately mixed. Therefore, Applicants respectfully submit that Sprengling and Jeffs (and/or Roscher), alone or in combination, fail to teach all of the claim limitations set forth in claim 22. Accordingly, it is submitted that a *prima facie* case of obviousness has not been established for this additional reason.

In view of the above, Applicants respectfully submit that independent claims 1 and 22 are not taught or suggested by Sprengling and Jeffs. With respect to dependent claims 2-9, 11, and 23-30, Applicants submit that because independent claims 1 and 22 are not taught or suggested within Sprengling and Jeffs and claims 2-9, 11, and 23-30 are dependent upon one of claim 1 or claim 22 and contain the same elements as the claim from which they depend, dependent claims 2-9, 11, and 23-30 are also not taught or suggested by Sprengling and Jeffs.

In light of the above, Applicants submit that claims 1-9, 11, and 22-30 are not obvious over Sprengling in view of Jeffs and respectfully request reconsideration and withdrawal of this rejection.

the reference or to combine reference teachings, and the prior art reference (or references when combined) must teach or suggest all the claim limitations. (See, e.g., *Manual of Patent Examining Procedure*, Patent Publishing,

New Claims 36-38

Although not included in any outstanding rejection, Applicants wish to briefly address newly added claims 36-38. In particular, Applicants respectfully submit that new independent claim 36 recites a process for manufacturing composite sheets that is neither taught nor suggested by Sprengling. Sprengling teaches the application of a dry resin powder to porous sheets in a manner to provide uniform, non-melted resin powder coverage throughout the fiber sheets. (*See, e.g.*, column 3, lines 36-64). These powdered sheets are then passed between pressure plates to cause melt flow impregnation of the resin particles “on top of and sifted within the porous sheets”. (*See, e.g.*, column 5, lines 18-24). Such pressure causes the resin to flow into and through the fibrous structure of the porous sheets to wet and bind together the fibers of each sheet and to bind the individual sheets together. (*See, e.g.*, column 5, lines 24-27). Indeed, the fibrous sheets of Sprengling are selected to allow good resin impregnation. (*See, e.g.*, column 2, lines 5-8).

In contrast, in the inventive method, a web of continuous yarns is heated to a temperature sufficient to melt the powder into a smooth surface layer. In addition, the intermediate structure of claim 36 produces a “barrier” effect by preventing interpenetration of the coating layer and the reinforced matrix in the final sheet. (*See, e.g.*, page 11, lines 26-28 of the specification). The smooth surface layer on the composite strip provides numerous advantages, such as improving the surface appearance, permitting for an easy application of patterns, and making it easier to keep the surface clean. (*See, e.g.*, page 1, lines 30-39 of the specification). Such advantages are neither envisioned nor obtained by the fibrous sheets of Sprengling. Indeed, Sprengling neither teaches nor suggests a smooth surface layer or an intermediate layer that acts to prevent the interpenetration of the coating layer. Sprengling specifically and clearly teaches resin impregnation into the fibrous sheets. As such, it is submitted that Sprengling, alone or in combination with any of the cited references, would not result in the claimed method. Accordingly, Applicants respectfully submit that claim 36, and all claims dependent therefrom, are non-obvious and patentable.

Conclusion

In light of the above, Applicants believe that this application is now in condition for allowance and therefore request favorable consideration.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

If necessary, the Commissioner is hereby authorized to charge payment or credit any overpayment to Deposit Account No. 50-0568 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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